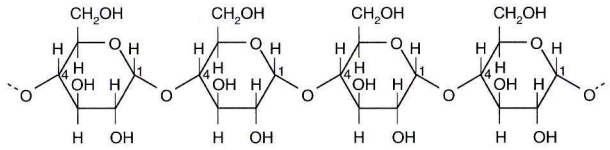
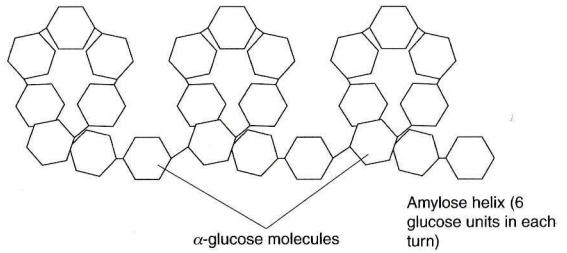
Polysaccharides are polymers formed by glycosidic bonding of monosaccharide subunits. The structure of these molecules affects their functions in living organisms.

Starch is a mixture of two polymers of α-glucose. The most common is **amylose** which usually contains about 300 glucose units joined by α 1,4 **glycosidic bonds**



The bulky $-CH_2OH$ side chains cause the molecule to take up a helical shape (excellent for packing many subunits into a limited space).

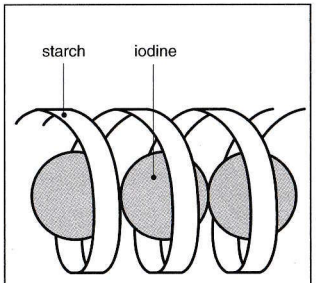


Because there are so few 'ends' within the starch molecule there are few points to begin hydrolysis by the enzyme **amylase**. Starch is therefore an excellent long-term **storage compound**.

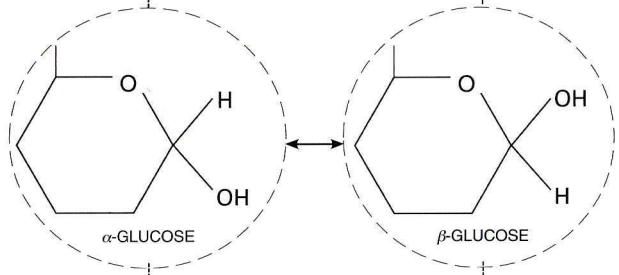
All those coils let you test for starch!

Add a drop of iodine solution (iodine in potassium iodide solution)

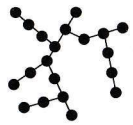
positive result (blue-black colouration) = ***starch present***



Principle: iodine binds to the centre of the starch helix, forming a starch-iodine complex which is intense blue-black in colour.

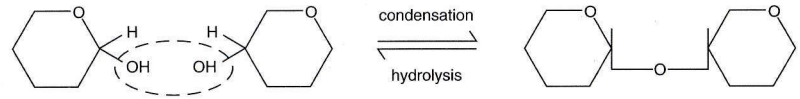


Glycogen is an α-glucose polymer, but with many cross-links and shorter α 1,4 chains.

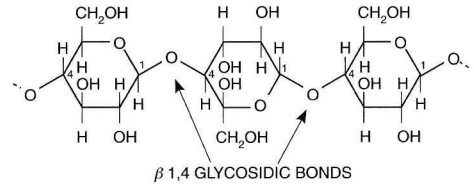


This gives more 'ends' to the molecule which is ideal for animal cells which may need to hydrolyse food reserves more rapidly than plant cells would do.

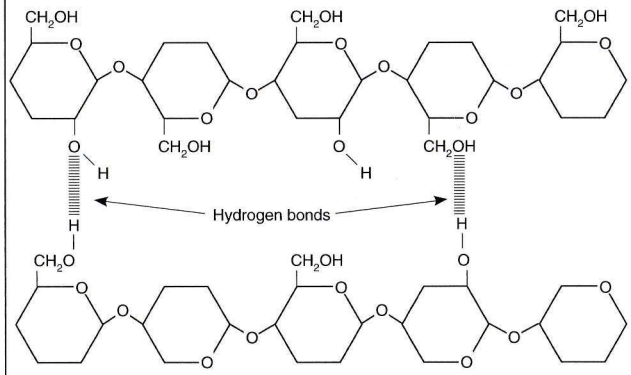
Subunits are joined by **condensation** (**removal** of the elements of water) and separated by **hydrolysis** (bond breakage by **adding** the elements of water)



Cellulose is a polymer of glucose linked by β 1,4 **glycosidic bonds.** The β-conformation inverts successive monosaccharide units so that a straight chain polymer is formed.



The parallel polysaccharide chains are then cross-linked by **hydrogen bonds.**



This cross-linking prevents access by water, so that cellulose is very resistant to hydrolysis and is therefore an excellent **structural molecule** (cellulose cell walls): ideal in plants which can readily synthesise excess carbohydrate.